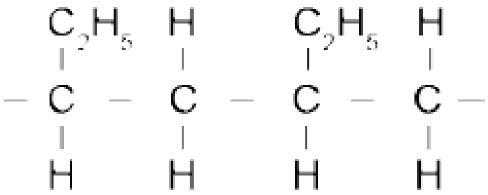
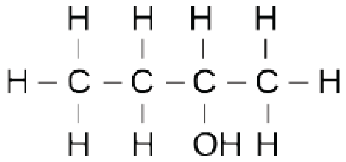
ANSWERS: Reactions flow charts

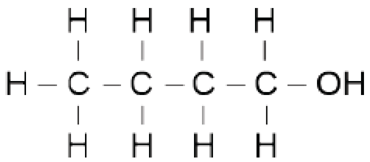
1) a i)



ii) H_2 (/Pt)
iii) PCl_3 / PCl_5 / $SOCl_2$
b) No; for a molecule to exist as geometric isomers, it must contain a double bond, and each carbon (involved in the double bond) must have two different atoms / groups attached to it. Compound A has a double bond, but the atoms attached to one carbon are both the same (two hydrogen atoms) so it does not form a geometric isomer.

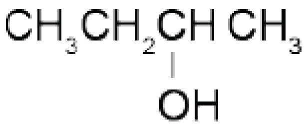
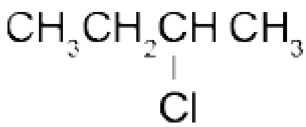


C



c) i) **D**

ii) C is the major product and D is the minor product. There are 2 possible products because when the double bond is broken, an H (or –OH) will bond to one C (and a –OH group (or H) will bond with the other C). The product will depend on which (C) the H (or the – OH) bond to.

C must be  since product **E** is  i.e. both functional groups are on the second carbon atom. If $CH_3CH_2CH_2\,CH_2OH$ was C then E would be $CH_3CH_2CH_2CH_2Cl$.

2) Compound A is $CH_3–CH_2–CH_2–OH$

Compound B is $CH_3–CH_2–CH_2–NH_2$

Reactant P is HCI

Reactant Q is concentrated H_2SO_4

Reactant R is HCl

(1) substitution.

(2) substitution.

(3) elimination.

(4) addition.

Molecules that undergo **substitution** reactions have carbon to carbon single bonds and form molecules with carbon to carbon single bonds. In a substitution reaction an atom or group of atoms is replaced by another atom or group of atoms.

Molecules that undergo **elimination** reactions have carbon to carbon single bonds and form molecules with carbon to carbon double bonds. In an elimination reaction two atoms or small groups are removed from a molecule forming a carbon to carbon to double bond.

Molecules that undergo **addition** reactions have carbon to carbon double bonds and form molecules with carbon to carbon single bonds. In an addition reaction the reaction involves breaking a double bond between the carbon atoms and forming a single bond in its place as well as forming two new single bonds.

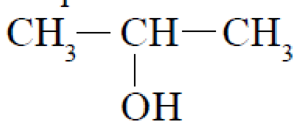
Reactions (1) and (2) are both substitution reactions as the molecules have carbon to carbon single bonds. In (1) the hydroxyl group (–OH) is replaced by a chloro group (–Cl). In (2) the chloro group (–Cl) is replaced by the amine group ($-NH_2$).

Reaction (3) is an elimination reaction as the molecule has carbon to carbon single bonds and a double bond is formed when it reacts. A hydrogen atom and the hydroxyl group on adjacent carbon atoms are removed forming a carbon to carbon double bond.

Reaction (4) is an addition reaction as the molecule has carbon to carbon double bonds and the product has carbon to carbon single bonds. In this reaction the double bond breaks forming a single bond, a hydrogen atom attaches itself to one of the carbon atoms and a chlorine atom attaches itself to the other carbon atom.

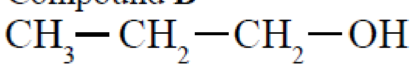
3)

Compound **A**



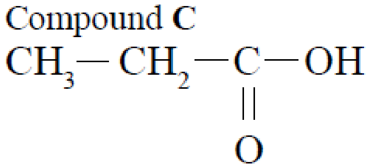
propan–2–ol

Compound **B**



propan–1–ol

Compound **C**

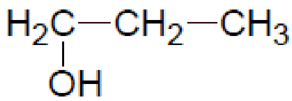
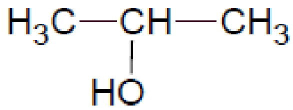
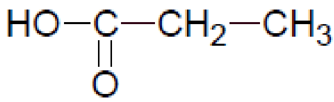


propanoic acid

Reagent **D** $Cr_2O_7^{2-}$ / H^+ **OR** MnO_4^- / H^+

Reagent **E** NaOH

4)

A		propene prop-1-ene 1-propene
B		propan–1–ol 1-propanol
C		propan–2–ol 2-propanol
D		propanoic acid